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FIG. 1

100

```
<?xml version="1.0" ?>

<xsd:schema xmlns:xsd=''http://www.w3.org/2001/XMLSchema''>

<!-- ***************************************************** -->
<!-- The root element defines a person.                  -->
<!-- ***************************************************** -->

110 ── <xsd:element name="person" type="personType"/>

120 {
<xsd:complexType name="personType" mixed="false">
    <xsd:all>
        <xsd:element name="name" type="xsd:string" minOccurs="1" maxOccurs="1" />  130
        <xsd:element name="address" type="xsd:string" minOccurs="1" maxOccurs="1" />  140
    </xsd:all>
    <xsd:attribute name="height" type="xsd:integer" use="optional" />  150
    <xsd:attribute name="weight" type="xsd:integer" use="optional" />  160
</xsd:complexType>
}
</xsd:schema>
```

FIG. 2

200

```
<?xml version="1.0" encoding="UTF-8"?>
<person
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http//www.myCompany.com/base.xsd"  220
    height=72 weight=190>
    <name>John</name>
    <address>123 Main Street</address>
</person>
```

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FIG. 3A

300

```
<?xml version="1.0"?>

<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">

<!-- ******************************************************* -->
<!-- This extension adds gender to a person.                 -->
<!-- ******************************************************* -->

310  <xsd:redefine schemaLocation="base.xsd">          311

     <xsd:complexType name="personType">                 321
       <xsd:complexContent>
         <xsd:extension base="personType">              322
           <xsd:attribute name="gender" type="xsd:string" use="optional" />   323
         </xsd:extension>
       </xsd:complexContent>
     </xsd:complexType>
   </xsd:redefine>
</xsd:schema>
```

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FIG. 3B

_330_

```
<?xml version="1.0" ?>

<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">

<!-- ************************************************************** -->
<!-- This extension adds age to a person.                          -->
<!-- ************************************************************** -->

340   <xsd:redefine schemaLocation="base.xsd">

      <xsd:complexType name="personType">          351
        <xsd:complexContent>                          352
          <xsd:extension base="personType">
            <xsd:attribute name="age" type="xsd:integer" use="optional" />   353
          </xsd:extension>
        </xsd:complexContent>
      </xsd:complexType>
                                                    350
      </xsd:redefine>
</xsd:schema>
```

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FIG. 3C

360

```xml
<?xml version="1.0" ?>

<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">

<!-- ****************************************************** -->
<!-- This extension adds marital status to a person. -->
<!-- ****************************************************** -->

370  <xsd:redefine schemaLocation="base.xsd">

      <xsd:complexType name="personType">            381
         <xsd:complexContent>
            <xsd:extension base="personType">         382
               <xsd:attribute name="maritalStatus" type="xsd:string" use="optional" />   383
            </xsd:extension>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:redefine>
</xsd:schema>
```

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FIG. 4A

400

```
<?xml version="1.0" encoding="UTF-8"?>
<person
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="//www.myCompany.com/ext1.xsd"
    height="72" weight="190" gender="M">
    <name>John</name>
    <address>123 Main Street</address>
</person>
```
410

FIG. 4B

430

```
<?xml version="1.0" encoding="UTF-8"?>
<person
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="//www.myCompany.com/ext2.xsd"
    height="72" weight="190" age="35">
    <name>John</name>
    <address>123 Main Street</address>
</person>
```
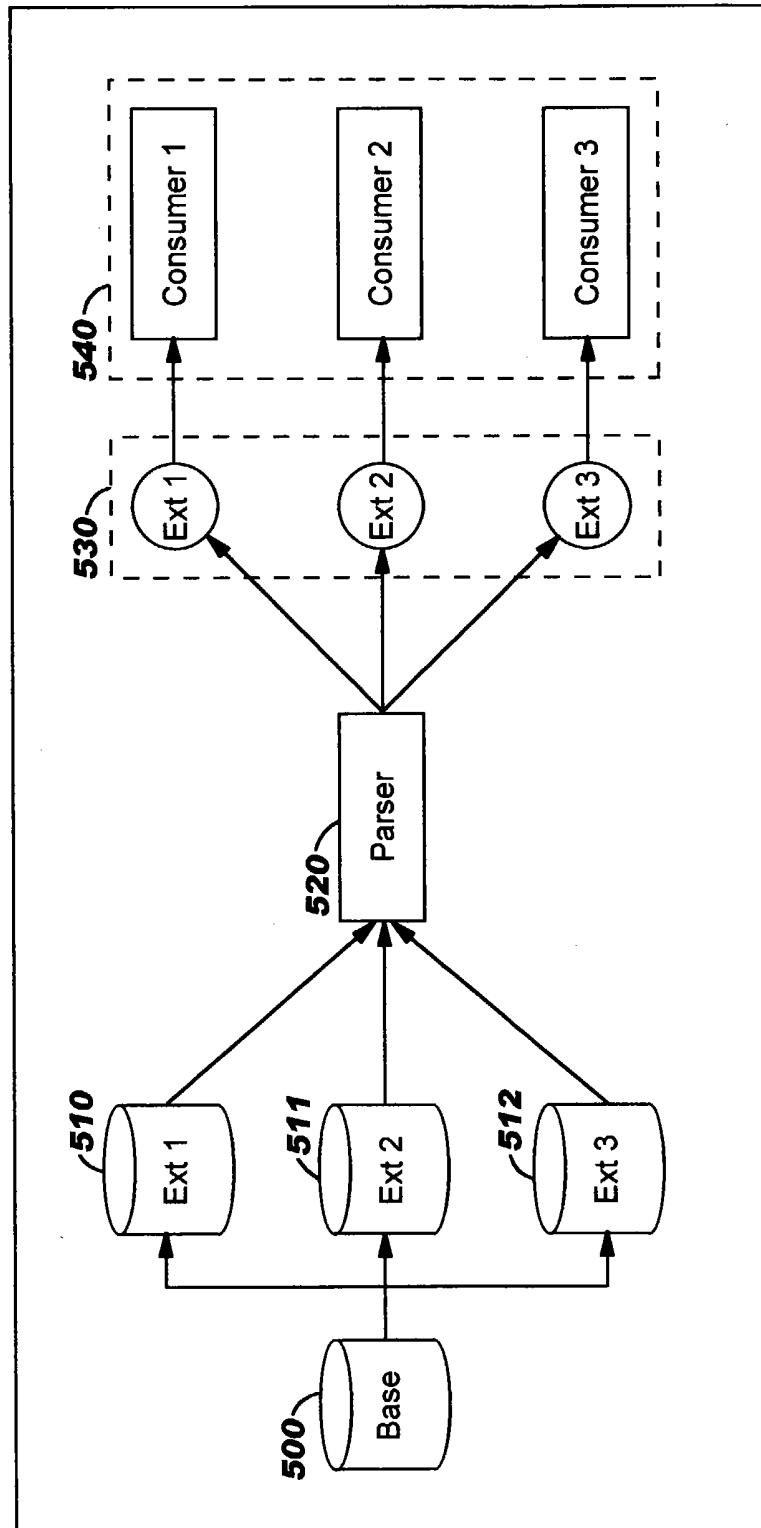440

FIG. 4C

460

```
<?xml version="1.0" encoding="UTF-8"?>
<person
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="//www.myCompany.com/ext3.xsd"
    height="72" weight="190" maritalStatus="Single">
    <name>John</name>
    <address>123 Main Street</address>
</person>
```
470

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FIG. 5
Prior Art

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FIG. 6

600

```xml
<?xml version="1.0" ?>

<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"/>

<!-- ***************************************************************** -->
<!-- The root element defines a person. -->
<!-- ***************************************************************** -->

<xsd:element name="person" type="person/Type"/>

<xsd:complexType name="personType" mixed="false">
    <xsd:all>
        <xsd:element name="name" type="xsd:string" minOccurs="1" maxOccurs="1" />
        <xsd:element name="address" type="xsd:string" minOccurs="1" maxOccurs="1" />
    </xsd:all>
    <xsd:attribute name="height" type="xsd:integer" use="optional" />
    <xsd:attribute name="weight" type="xsd:integer" use="optional" />
    <xsd:attribute name="gender" type="xsd:string" use="optional" />
    <xsd:attribute name="age" type="xsd:integer" use="optional" />
    <xsd:attribute name="maritalStatus" type="xsd:string" use="optional" />
</xsd:complexType>
</xsd:schema>
```

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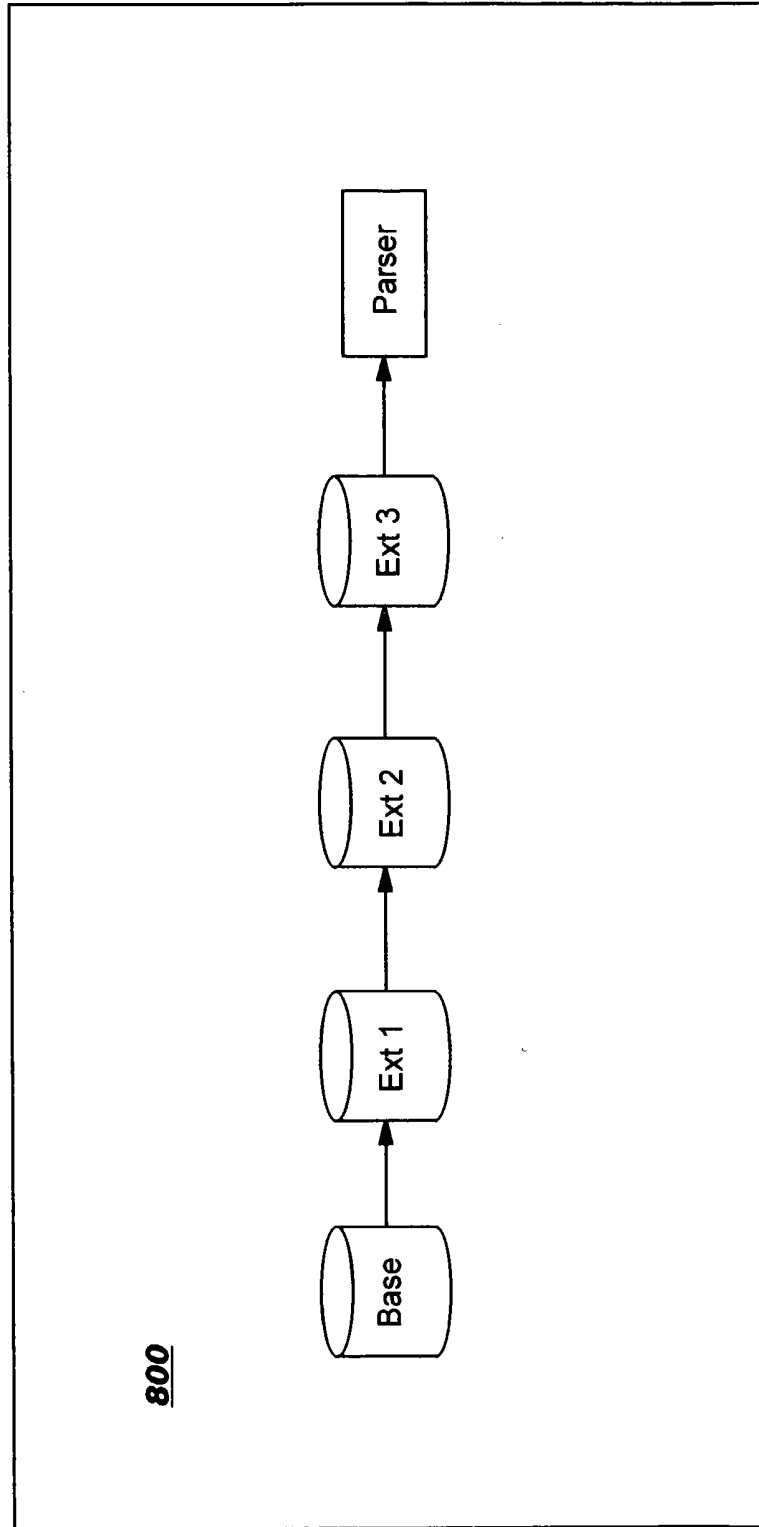
FIG. 7

700

```xml
<?xml version="1.0" encoding="UTF-8"?>
<person
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="//www.myCompany.com/ext3.xsd"
  height="72" weight="190" gender="M" age="35" maritalStatus="Single">
  <name>John</name>
  <address>123 Main Street</address>
</person>
```
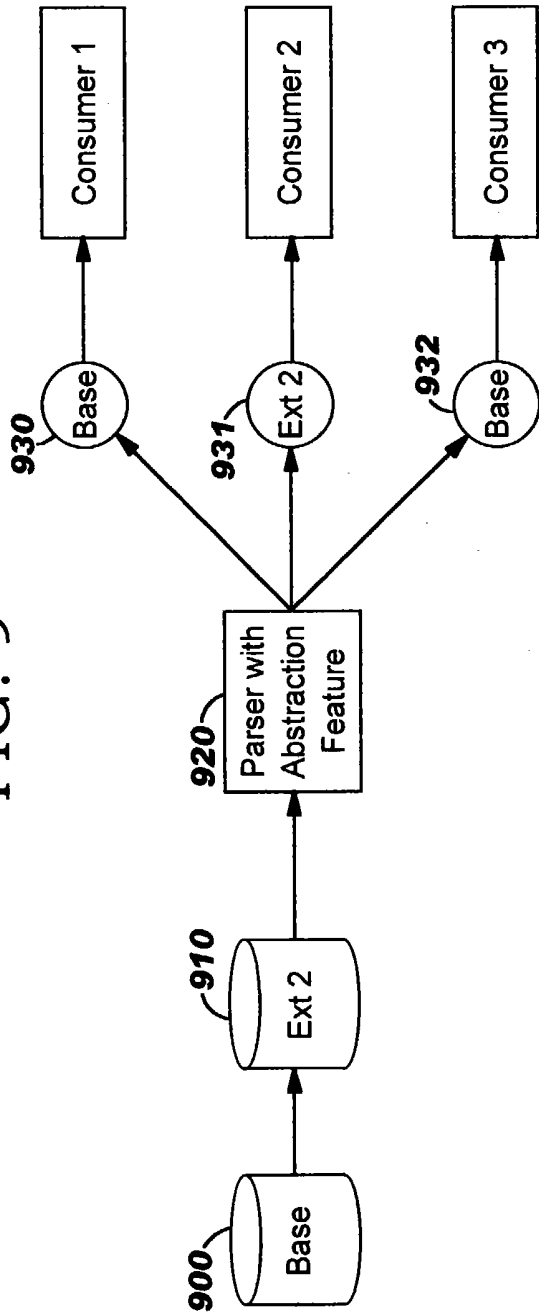
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FIG. 8

800

Base → Ext 1 → Ext 2 → Ext 3 → Parser

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FIG. 9

FIG. 10

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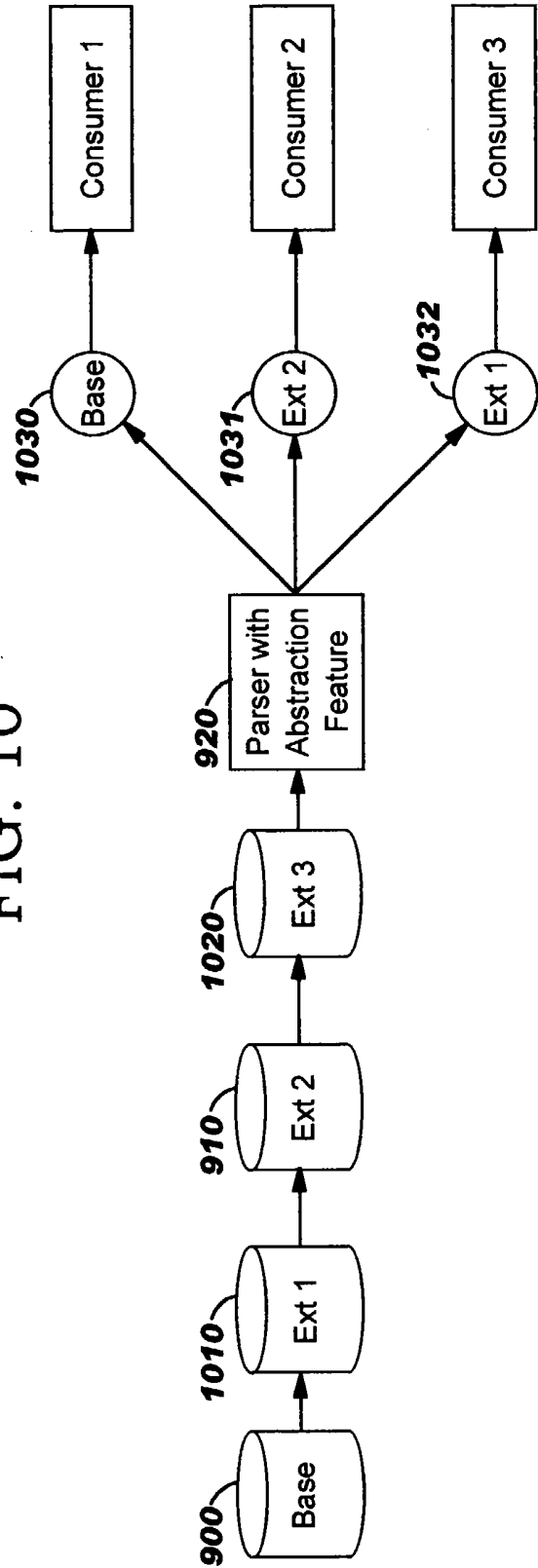Heng Chu, et al.

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FIG. 11

1100

```
SAXParser parser = new SAXParser();                                          1111
parser.setContentHandler(newContentHandler());
parser.setErrorHandler(errorHandler);
```
1110

```
try
{
    parser.setFeature("http://apache.org/xml/features/validation/");         1131
    parser.setFeature("http://www.myCompany.com/xml/features/abstraction", "xmlns:base");   1132
}
catch (Exception e)
{
    // if feature isn't recognized, print a message
    System.out.println("The Feature is unknown");
}
```
1120

1130

```
parser.parse(...);
```
1140

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FIG. 12

1200

Someone.xml

element:person
attribute:height
attribute:weight
attribute:gender

parse →

1210

Parser with Abstraction Feature

1220

Apply schema validation using extended schema

invalid

OK

1230

Apply abstraction level requested by application

ignore

OK

1240

Pass to application for further processing